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ARIZONA STATE UNIVERSITY ■ COLLEGE OF BUSINESS
BUREAU OF BUSINESS AND ECONOMIC RESEARCH

Astronomy Adds $84 Million to Arizona Economy

As host to the largest collection of research-quality telescopes in the world (see Table 1), Arizona has benefited from astronomy's transition into big business. The value of construction activity required to build the observatories and the annual expenditures for their operation represent a substantial contribution to the local economy. To document the magnitude of this contribution, all astronomy-related agencies in Arizona were asked to provide information concerning employment, expenditures, and the value of physical plant and equipment during the 1982-83 fiscal year. Seventeen agencies supplied the requested data, and the results of this survey are summarized in Table 2.

DIRECT EXPENDITURES

Astronomical facilities provided jobs for 862 Arizonans during 1982-83, and their combined annual operating expenditures totaled $34 million. About two-thirds of that total ($21 million) paid personnel costs, including salaries; other costs of operation made up the remaining $13 million. The Kitt Peak National Observatory is the largest facility in the state, with 284 employees and annual operating expenditures of more than $13 million.

Total value of astronomical facilities and equipment in Arizona was estimated at nearly $300 million (in 1983 dollars). More than half of this total ($158 million) comprises all facilities associated with the Kitt Peak National Observatory; in addition, the

See "Astronomy," page 2

GSP Growth Sets Record In '84

Despite slower growth during the fourth quarter, the Arizona Gross State Product (GSP) expanded at an inflation-adjusted 14.4 percent rate during 1984, surpassing the prior record of 12.1 percent during 1978. The record expansion during 1984 followed a 10.3 percent GSP rise during 1983, which was the third greatest in the 24 years for which GSP data are available.

Double-digit GSP gains had occurred during the first three quarters of 1984, including a sharply revised increase of 12.1 percent during the third quarter (see Table 1). An inevitable deceleration of growth in the Arizona economy began during the fourth quarter, when the GSP, excluding the agriculture and mining industries, rose just 4.6 percent.

The economy's smaller fourth quarter gain was especially due to a slight decline in the GSP of the finance, insurance and real estate

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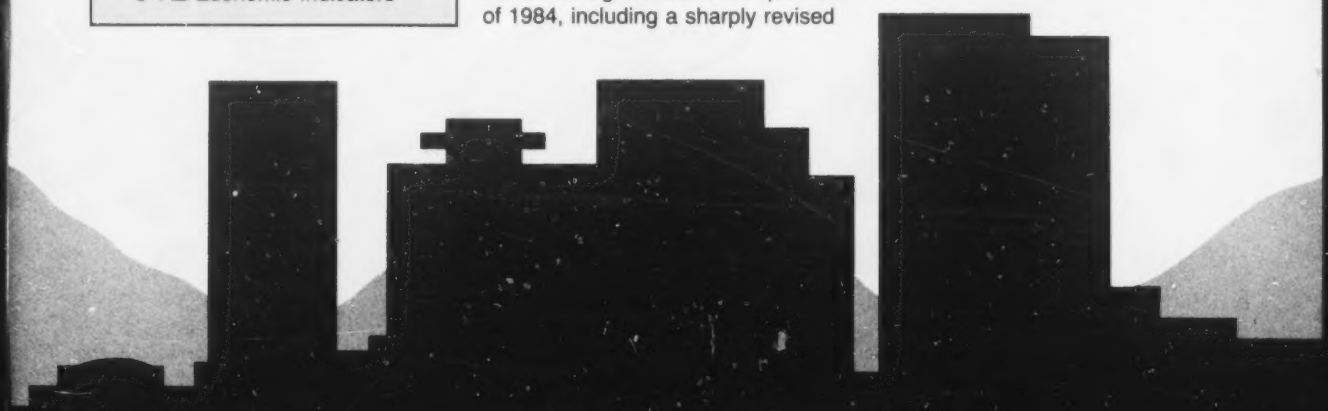

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Smithsonian Institution's Fred Lawrence Whipple Observatory and Multiple Mirror Telescope Observatory facilities on Mt. Hopkins are valued at $50 million, and several other agencies reported physical plants worth more than $10 million. Several agencies also reported planned expansions and/or new astronomical facilities that could potentially total more than $110 million in value.

Taking all of Arizona's facilities together, the number of employees involved in astronomy is equivalent to the number of jobs provided by a large private sector employer, such as one of the top 20 high technology companies in the state. The annual operating expenditures of $34 million in 1983 is equivalent to more than one-half of the total National Science Foundation budget for astronomy ($62.5 million) for the same period.

TOTAL IMPACT

Although already sizable, the figures presented in Table 2 do not represent the full contribution of Arizona's observatories to the state's economy. Many of the facilities are used extensively by scientists from other parts of the nation and world. While in Arizona, non-resident scientists spend money for lodging, meals, and other expenses, estimated by the facilities to total $975,000 during 1982-83.[1]

These indirect expenditures plus the fact that almost $30 million of the total $34 million in annual operating expenditures is funded by out-of-state agencies (the National Science Foundation and NASA, for example) qualify Arizona's astronomical activities as a basic industry. Astronomy brings dollars into the state, which are spent within the local economy, providing revenues for local businesses and income for local residents. In turn, as these revenues are respent in Arizona, additional income and jobs are generated.

To estimate the total contribution of astronomy to the state's economy, these induced expenditures must also be taken into account. For example, the so-called "multiplier effect" for high technology industries in Arizona has been estimated to have a value of 2.4[2] ($1 of direct spending by a high-tech firm ultimately generates additional spending of $1.40 in other sectors of the economy), making the total economic impact of every dollar spent equal to $2.40. Assuming the multiplier for astronomy is similar to such high-tech activities, astronomy's overall annual contribution to the state's economy in 1982-83 was $83.9 million.

OUTLOOK

Modern astronomical research requires siting telescopes on high mountaintops in an area where a maximum number of cloudless nights prevail. The Southwest is the only area in the mainland United States, and one of only four areas in the world, that satisfies these requirements. Hence, a National Observatory and several other major astronomical facilities have been located in the mountains surrounding the Tucson urban area.

Interestingly, one of the major reasons that Kitt Peak was chosen in 1958 as the site for a National Observatory was the lack of background illumination in the night sky. At that time, it was believed that further growth in the Tucson area, 45 miles away, would not adversely affect Kitt Peak's celestial observations. How-

[1]This estimate was computed on the basis of $30/day at astronomical sites, $75/day for "in-town" activities, and $1,000/month for longer-term visitors.

[2]This multiplier value was taken from the publication, *High Technology in Arizona*, Arizona Office of Economic Planning and Development, 1984.

TABLE 1
MAJOR OBSERVATORIES IN ARIZONA

Observatory	Location
Kitt Peak National Observatory	Kitt Peak, southwest of Tucson
Lowell Observatory	Flagstaff
Multiple Mirror Telescope	Mt. Hopkins, southeast of Tucson
National Radio Astronomy Observatory	Kitt Peak
Steward Observatory	Facilities on Kitt Peak and Mt. Lemmon, northeast of Tucson
U.S. Naval Observatory	Flagstaff
Whipple Observatory	Mt. Hopkins

Source: Astronomy and Communities: The Impact of Lighting Practices, a research report by the authors, May 1985.

TABLE 2
ECONOMIC CONTRIBUTION
OF ASTRONOMICAL ACTIVITIES IN ARIZONA
1982-83

Number of Agencies[a]	17
Number of Employees	862
Total Direct Expenditures	$33,895,000
Value of Physical Plant (1983 $)	$291,385,000
Value of Planned Projects (1983 $)[b]	$110,765,000
Visitor Expenditures[c]	$975,000
Number of Tourists	215,000

[a]The 17 agencies in this survey (with their total fiscal year 1982-83 expenditures in millions of dollars): Kitt Peak National Observatory ($13.2 million; U. of Arizona Optical Sciences Lab ($5.3 million); U. of Arizona Steward Observatory ($5.13 million); U. of Arizona Lunar and Planetary Lab ($3.1 million); National Radio Astronomy Observatory ($1.1 million); Whipple Observatory ($1.05 million); Multiple Mirror Telescope Observatory ($1.0 million); Lowell Observatory ($0.93 million); U. of Arizona Physics Dept. ($0.8 million); ASU Planetary Geology ($0.54 million); U.S. Naval Observatory ($0.53 million); U. of Arizona Flandreau Planetarium ($0.37 million); Planetary Sciences Institute ($0.35 million); ASU Astronomy ($0.22 million); NAU Astronomy ($0.15 million); McGraw-Hill Observatory ($0.11 million); ASU Planetarium ($0.03 million).

[b]Includes the projected cost of National New Technology Telescope. Mt. Graham in Arizona is one of two sites being considered.

[c]Includes only expenditures by out-of-state astronomers and other scientists who visit Arizona facilities as part of their usual astronomical activities.

Source: Astronomy and Communities: The Impact of Lighting Practices, a research report by the authors, May 1985.

ever, the light from Tucson and small communities nearer the observatories, along with the sky glow of metropolitan Phoenix (an area much more distant but having three times Tucson's population) have begun to produce substantial background illumination in the skies over these observatories.

Unless the growing background illumination is controlled, modern astronomical observation will no longer be possible at Arizona's observatories. Additional "light pollution" would diminish the usefulness of existing observatories and adversely impact planning for future astronomical facilities. Mt. Graham, in southeast Arizona near Safford, for example, has been selected as the site for a new observatory to be developed jointly by the University of Arizona and Ohio State University. The same mountain is in competition with Mauna Kea in Hawaii to be the site for the National New Technology Telescope (NNTT) Observatory that will house a planned 15-meter instrument. With projected costs of $25 million for the U of A/OSU telescope and well over $100 million for the NNTT, the building of such facilities in Arizona would generate a sizable economic impact.

To combat further increases in background illumination from outdoor lighting, the astronomical community has been encouraging city and county governments throughout Arizona to adopt "dark skies" ordinances, which would limit artificial sky glow. Although the observatories in Arizona have not yet been seriously affected by the growth of neighboring communities, failure to adopt such ordinances will have an adverse future effect on both celestial observations and the Arizona economy.

— Timothy D. Hogan
David Burstein
Michael D. Kroelinger

Dr. Hogan is Professor of Economics in the ASU College of Business and Director of the State Data Center. Dr. Burstein is Assistant Professor of Physics/Astronomy, and Dr. Kroelinger is Associate Professor of Design Sciences in the College of Architecture and Environmental Design.

The authors gratefully acknowledge funding by the Arizona State University Research Fund for a grant entitled, "A Comprehensive Evaluation of the Impact of Community Lighting on Astronomy in Arizona." The foregoing article reports on the economic impact aspects of that research project.

"1984 GSP," from page 1

sector, after a record expansion earlier in 1984, and to virtually no gain in the GSP of the manufacturing industry, following near-record growth earlier in the year. While employment continued to rise during the fourth quarter, output per employee declined sharply, after posting solid gains in six of seven prior quarters.

ANNUAL ECONOMIC GROWTH

The Arizona GSP expanded during 1984 at a rate more than twice that of the Gross National Product (GNP), which grew at a more rapid pace than in any year since 1951 (see Figure I). This growth pushed the state's gross product past $41.5 billion in current dollars (see Table 2).

The GSP of each sector of the Arizona economy climbed during 1984, with most sectors expanding at the fastest rate in several years. Leading the increases were a record 28.0 percent inflation-adjusted rise in the GSP of the finance, insurance and real estate sector and a record gain of 13.3 percent for the trade industry. Manufacturing recorded its second highest rate of growth, 14.7 percent, with the smallest gain occurring in the government sector, 2.8 percent.

SECTORAL SHARES

The trade industry remained Arizona's largest during 1984. In current dollars, its $7.2 billion gross product represented 17.4 percent of the state's total. With a gross product of nearly $6.9 billion, the manufacturing industry surpassed the finance, insurance and real estate sector to become the state's second largest. The agriculture and mining industries continued to decline in importance and remained the state's smallest sectors (see Figure II).

EMPLOYMENT AND PRODUCTIVITY

Employment in Arizona rose 9.6 percent during 1984, more than in any year since 1978. The number of

TABLE 1
QUARTERLY ECONOMIC GROWTH

	Arizona Gross State Product				Gross National Product
Quarter[r]	*Billions of Current Dollars, Annualized*	*Billions of 1972 Dollars, Annualized*	*Annualized Percent Change (1972 Dollars)*	*Annualized Percent Change (Adjusted GSP)**	*Annualized Percent Change (1972 Dollars)*
First, 1983	$33.802	$16.646	12.6%	15.9%	3.3%
Second, 1983	35.571	17.467	19.7	22.1	9.4
Third, 1983	37.212	18.119	14.9	13.4	6.8
Fourth, 1983	38.223	18.534	9.2	5.7	5.9
First, 1984	39.770	19.535	21.6	22.5	10.1
Second, 1984	40.840	19.897	7.4	11.7	7.1
Third, 1984	42.308	20.686	15.9	12.1	1.6
Fourth, 1984	43.266	20.945	5.0	4.6	4.3

*The adjusted GSP is the annualized GSP in billions of 1972 dollars, minus the contributions of the agriculture and mining industries.

[r]All quarters have been revised.

Source: Bureau of Business and Economic Research, College of Business, Arizona State University; in cosponsorship with the ASU College of Business Dean's Council of 100.

workers employed by the construction industry jumped 22.5 percent, but this gain merely represented a typical expansionary movement for this highly cyclical industry. Employment in the services industry advanced a record 13.2 percent. At the other extreme, mining employment again declined, and government employment rose only marginally.

This large expansion in employment, coupled with the second highest recorded gain in inflation-adjusted output per employee, produced the record GSP increase. A 4.8 percent rise in output per employee was led by the fifth consecutive annual productivity gain in the mining industry and by the second consecutive jump in productivity of the finance, insurance and real estate sector. In contrast, output per employee declined in the construction and services industries, each of which has rarely produced a gain since 1971.

DEFLATORS

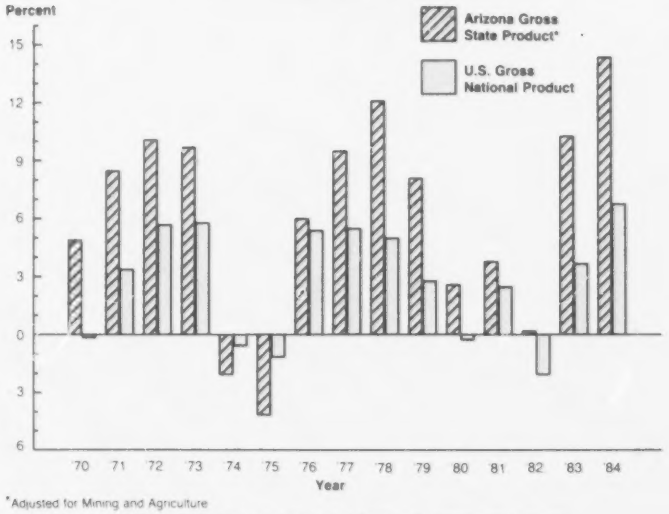
The Arizona GSP implicit price deflator measured a 3.4 percent inflation rate during 1984, slightly less than the 3.8 percent rate of the GNP deflator. For each of the last three years, the Arizona deflator has gauged the inflation rate at between 3.1 percent and 3.6 percent.

The deflator for the finance, insurance and real estate sector declined sharply during 1984, following a slight drop in 1983; these decreases contributed to the rapid gains in this sector's real GSP. Mining's deflator also declined as the price of copper resumed its drop, following a slight interruption during 1983.

OUTLOOK

The Arizona economy has experienced vigorous growth since the

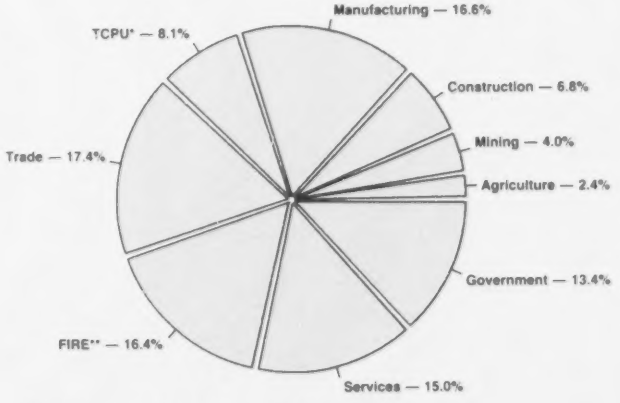
FIGURE I
ARIZONA GROSS STATE PRODUCT*
AND U.S. GROSS NATIONAL PRODUCT
Annual Percent Change



*Adjusted for Mining and Agriculture

Source: Bureau of Business and Economic Research, College of Business, Arizona State University

FIGURE II
ARIZONA GROSS STATE PRODUCT
Sectoral Shares, in Current Dollars
1984



*TCPU — Transportation, Communications, and Public Utilities
**FIRE — Finance, Insurance, and Real Estate

Source: Bureau of Business and Economic Research, College of Business, Arizona State University

TABLE 2
ANNUAL ECONOMIC GROWTH

	Arizona Gross State Product				Gross National Product
Year[r]	*Billions of Current Dollars*	*Billions of 1972 Dollars*	*Percent Change (1972 Dollars)*	*Percent Change (Adjusted GSP)**	*Percent Change (1972 Dollars)*
1980	$28.550	$15.618	3.9%	2.6%	−0.3%
1981	32.311	16.874	8.0	3.8	2.5
1982	32.510	16.383	−2.9	0.2	−2.1
1983	36.202	17.692	8.0	10.3	3.7
1984	41.546	20.266	14.6	14.4	6.8

***The adjusted GSP is the GSP in billions of 1972 dollars, minus the contributions of the agriculture and mining industries.**

[r]All years have been revised.

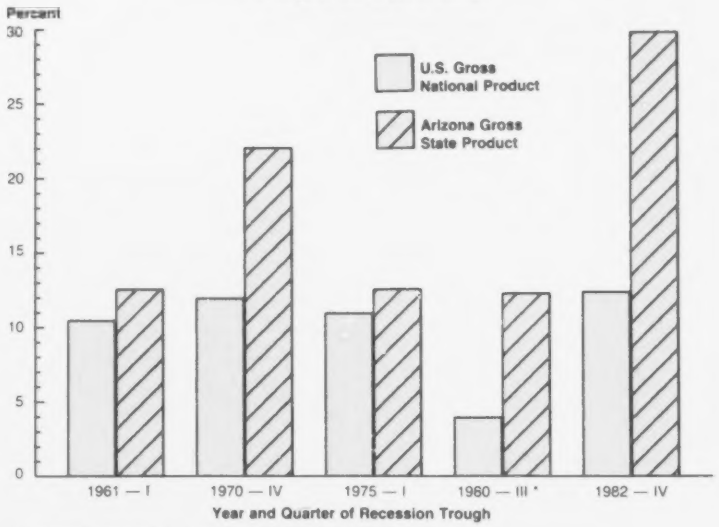
Source: **Bureau of Business and Economic Research, College of Business, Arizona State University; in cosponsorship with the ASU College of Business Dean's Council of 100.**

trough of the recession in the fourth quarter of 1982. During the two years of the current recovery, Arizona GSP has grown 29.8 percent in 1972 dollars (Figure III). This rate of growth is more than twice that for Gross National Product (12.4 percent) over the same eight-quarter period and nearly one-third greater than the 22.1 percent growth recorded during the two-year period after the trough of fourth quarter, 1970.

At present, the prevailing outlook on the national level is for no recession in 1985. The consensus of 50 economists polled for Robert Eggert's *Blue Chip Economic Indicators* is that real growth in GNP will be slightly more than 3 percent during 1985. Inflation, as measured by the rate of change in the Consumer Price Index, is forecast to remain below 4 percent, although the unemployment rate is not expected to dip below 7.2 percent.

Slower economic growth experienced in Arizona during the fourth quarter is likely to continue during 1985, but the rate of growth probably will fluctuate widely from quarter to quarter. Gains from one sector to another are also likely to vary considerably because of the uneven effects of the dollar's strength and the trade and budget deficits. Despite these ups and downs, Arizona GSP growth is expected to exceed 5.5 percent, the long-term annual average, and may exceed 7 percent.

FIGURE III
U.S. GNP AND ARIZONA GSP
Percent Change from Recession Trough
To Eight Quarters Later



* Four quarters from trough. Recovery did not last eight quarters.

Source: Bureau of Business and Economic Research, College of Business, Arizona State University.

— **Tom R. Rex**
Research Manager

Purchasing Indicators Stay Positive in April

The Arizona economy extended its expansion in April, now into the second quarter and well into its third year. All indicators were positive, but the growth rate in both new orders received and production declined somewhat from the previous month. The price picture showed signs of heating up.

The upward thrust should continue during the spring and summer months, although at only a moderate rate. Inflation probably will step up slightly, but not enough to put the expansion in jeopardy. Employment gains will continue at a relatively slow pace.

Table 1 presents the results of the April survey of Arizona purchasing managers.

TABLE 1
APRIL PURCHASING SURVEY

Key Indicators	Percent of Purchasing Managers Indicating Each Response (April compared to March) *Higher*	*Same*	*Lower*
Prices paid for major commodities	27	66	7
Delivery time from vendors	21	63	16
Purchased materials inventory level	33	48	19
New orders received	40	35	25
Production	41	42	17
Employment	29	55	16
Purchases	40	41	19

Source: Purchasing Management Association of Arizona and the Purchasing Management Association of Southern Arizona.

PRICES/DELIVERY TIME

Prices paid for major purchased items advanced in April at the highest rate since January and almost double the March rate. Although the inflation rate accelerated, it still is well under all but four months of 1984, and it seems unlikely that it will reach a level anytime soon that might threaten a continuation of the expansion.

Delivery time on shipments from vendors stretched, following the previous month's static performance. The extension of vendor lead times was small and less than any month of 1984. Such sluggishness shows that the expansion rate has moderated during the first part of 1985.

INVENTORIES/NEW ORDERS

Inventory levels of purchased materials went up substantially in April, following nine months of essentially level performance. This was the largest net increase since June 1984. The close control of inventories exercised by Arizona firms has been one of the principal factors permitting the expansion to continue on a stable,

See "April Purchasing," page 6

"April Purchasing," from page 5
although not flashy, course into its third year.

New orders received by Arizona firms rose again, but at a smaller rate than in either of the past two months. The increase rates so far this year all have been smaller than during the first half of last year, showing that the pace of the expansion has slowed. This is a fairly predictable occurrence for an expansion now well into its third year.

PRODUCTION/EMPLOYMENT

Production also continued to accelerate, but at a slower rate, reflecting the decline in new order growth. Even at the slower increase rate, production activity in Arizona remains healthy.

Employment rose in April for the fourth month in a row. The increase was almost identical to that during each of the previous two months. Further moderate employment hikes should continue over the summer months.

Arizona Purchasing Survey

Now in its 23rd year of monthly reporting, Dr. Harold Fearon's survey of Arizona business conditions utilizes data from a questionnaire sent to members of the purchasing management associations of Arizona and southern Arizona. It asks them to indicate the direction of activity—higher, unchanged, or lower—of seven key measures of economic activity in the month just ended. These purchasing managers deal daily with supply, demand, and price factors in the marketplace; their aggregate readings have accurately charted the state's economic course for two decades, providing timely data on turning points.

PURCHASES

Purchases of materials and supplies by Arizona firms increased at the same rate as in March. The advance in the purchase commitment rate has been consistent during the past several months, but well below the gains recorded during the first half of 1984. However, the increase continues to have a stimulative effect on the economy's overall performance.

— Harold Fearon

Dr. Fearon is chairman of the Department of Purchasing, Transportation, Operations in the ASU College of Business and is the National Association of Purchasing Management Professor.

Valley Home Sales Fall in First Quarter

The number of homes sold in the Phoenix metropolitan area during the first quarter declined 20 percent from the fourth quarter, 1984, level (see Table 1). Fewer homes were sold in every category.

First quarter sales also declined from the first quarter, 1984, level. Only sales of existing single family homes, the largest market segment, did not suffer a sharp drop. The decrease in new home sales largely resulted from higher interest rates during the summer and fall of 1984, when most of the new homes sold during the first quarter were started. New home sales should rebound during the spring and summer, in response to lower mortgage interest rates.

MEDIAN SALES PRICE AND APPRECIATION RATE

The median sales price fell for the second consecutive quarter, although it rose for new single family homes. Instead of accelerating, as many observers expected, inflation in home prices has slowed to minimal levels. From the first quarter, 1984, through the first quarter, 1985, the median price of existing townhouses and condominiums rose less than 1 percent, and the price of existing single family homes increased just 2 percent. While the median sales price of new single family homes was nearly 7 percent more than that of one year ago, this gain is less than the 10 percent annual average during 1984.

A small gain in the appreciation rate during the first quarter substantiates the slower inflation. Home values rose 0.7 percent for the second successive quarter, the smallest gains recorded since initiation of the appreciation measure in 1981. Homes in the Phoenix area appreciated just 3 percent during the year ended first quarter, 1985.

— Tom R. Rex
Research Manager

TABLE 1
METROPOLITAN PHOENIX HOME SALES

	Single Family			Townhouse/Condominium			Grand
First Quarter, 1985	*Resale*	*New*	*Total*	*Resale*	*New*	*Total*	**Total**
Median sales price	$70,900	$79,925	$73,000	$62,500	$58,000	$62,000	$71,625
Percent change from:							
Fourth quarter, 1984	−1.8	1.6	−2.3	−2.2	−10.5	−3.8	−0.6
First quarter, 1984	2.0	6.9	2.5	0.8	3.0	3.3	3.1
Number of sales	8,073	1,690	9,763	910	185	1,095	10,858
Percent change from:							
Fourth quarter, 1984	−8.3	−33.7	−14.0	−25.2	−79.8	−48.6	−19.5
First quarter, 1984	−5.2	−33.8	−11.8	−25.2	−73.3	−42.7	−16.4

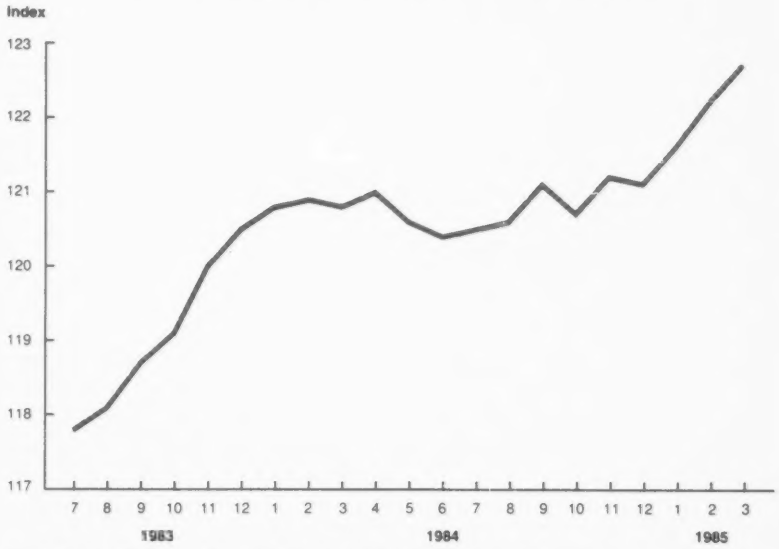
Source: Bureau of Business and Economic Research, College of Business, Arizona State University; from data supplied by Marketron Services, Inc., Phoenix.

Arizona Leading Index Posts Third Straight Gain

The Arizona Index of Leading Economic Indicators rose 0.3 percent in March 1985, the third consecutive gain, following a year of erratic monthly changes (see Figure I). The index reached 122.7, up from 122.3 in February (1977 = 100).

Only three of the ten index components advanced in March. The diffusion index (the proportion of increasing to decreasing components) of only 30 percent reveals that the March gain in the index needs to be carefully interpreted. It more closely represents a return to the erratic conditions of 1984 than a continuation of the stronger gains experienced in January and February.

FIGURE I
ARIZONA INDEX OF LEADING ECONOMIC INDICATORS



Source: Bureau of Business and Economic Research, College of Business, Arizona State University.

INDEX COMPONENTS

National money supply (M2) again contributed to the index's gain in March, but it grew at a slower rate than during the prior four months (see Table 1). In addition, the level of residential building permits rose for the seventh consecutive month, though at a lesser rate than in February. Finally, average weekly hours worked in the manufacturing industry increased for the second consecutive month.

All five components derived from a survey of the purchasing management associations of Arizona and southern Arizona declined by slight amounts in March, returning to the slow downward trend that was present throughout 1984. The value of each of these components in March was at least 5 percent less than its peak reached at approximately the beginning of 1984.

Unemployment insurance claims rose slightly in March, for the fourth straight month, a negative factor in the index. The second consecutive drop in prices of sensitive raw materials was another negative factor.

TABLE 1
NET CONTRIBUTION OF INDIVIDUAL COMPONENTS TO THE ARIZONA INDEX OF LEADING ECONOMIC INDICATORS

	Net Contribution[+]		
	Jan.	*Feb.*	*March*
Delivery Time*	−.02	.00	−.05
Inventory Levels*	−.03	−.03	−.01
New Orders*	−.02	.01	−.02
Production*	.02	.00	−.05
Employment*	−.01	.00	−.01
Residential Building Permits	.08	.12	.07
Unemployment Insurance Claims	−.19	−.10	−.02
Average Workweek, Manufacturing	−.16	.12	.27
Money Supply	.80	.67	.39
Change in Sensitive Materials Prices	.04	−.08	−.13
OVERALL INDEX	.51	.70	.44

[+] The net contribution of each component is calculated by multiplying the monthly change in its index by its relative importance.

*Based on indicators from the purchasing management associations of Arizona and southern Arizona.

Source: Bureau of Business and Economic Research, College of Business, Arizona State University.

OUTLOOK

After sizable gains in January and February, the national Index of Leading Economic Indicators fell in March. Both in Arizona and nationally, a brief, two-month upsurge was, at the least, interrupted in March. Thus, both the Arizona and national economies may grow at a slightly greater rate during the second quarter than during the subpar first quarter, but the March leading indexes suggest this only to be a continuation of the oscillating growth experienced since last summer. The leading indicators continue to signal neither an upcoming recession nor a return to solid growth.

An early look at the April Arizona index, based only on those components from the survey of Arizona purchasing management associations, indicates that the economy will continue to expand. Four of the five components were up, each by the greatest amount since December.

— **Luke Koons**
Research Analyst

— **Tom R. Rex**
Research Manager

ARIZONA ECONOMIC INDICATORS

	Month or Quarter	Value	Percent Change from Previous Period	Percent Change from Year Ago	Year-to-Date Value	Year-to-Date Percent Change from Year Ago
GROSS STATE PRODUCT (In Billions of Dollars, at Annual Rate)						
Arizona - Current Dollars	4th Qtr.	43.266	9.1	13.2	NA	NA
Arizona - 1972 Dollars	4th Qtr.	20.945	5.0	13.0	NA	NA
CONSUMER PRICE INDEX (1977 = 100)						
Metropolitan Phoenix	1st Qtr.	187.8	1.8	5.9	NA	NA
INDEX OF LEADING ECONOMIC INDICATORS (1977 = 100)						
Arizona	March	122.7	0.3	1.6	NA	NA
BUILDING PERMITS (Total Dollar Value in Thousands)						
Maricopa County	Feb.	364,017	3	9	715,486	16
Pima County	Feb.	70,633	20	− 8	129,443	− 3
Balance of State	Feb.	39,583	−17	−31	87,047	−14
Arizona	Feb.	474,233	3	1	931,976	9
TOTAL HOUSING UNITS AUTHORIZED						
Maricopa County	Feb.	5,624	9	14	10,759	1
Pima County	Feb.	1,178	− 7	−20	2,450	−25
Balance of State	Feb.	1,160	6	0	2,259	− 6
Arizona	Feb.	7,962	5	5	15,506	− 4
HOME SALES						
Maricopa County - Number	March	4,178	19	− 7	10,858	−16
Maricopa County - Median Price	March	71,400	1.0	2.7	71,625	3.1
ELECTRICAL POWER SALES (In Millions of Kilowatt Hours)						
Arizona	March	2,593.6	3.4	9.2	7,853.2	9.2

NA = Not Applicable

Source: Bureau of Business and Economic Research, College of Business, Arizona State University.

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Migration Patterns Net Arizona More Residents

Of the 50 states, Arizona experienced the fourth greatest net in-migration of residents between 1975 and 1980, as 246,000 more people moved to Arizona than left for other states. Only Florida, Texas and Washington gained more population through migration, and only Nevada's net migration as a proportion of its total population exceeded Arizona's proportion.

Several states received a greater number of new residents between 1975 and 1980 than Arizona's 598,000 in-migrants, but most lost nearly as many, or more, residents to other states. More people (1.9 million) moved to California than to any other state, although Florida's 1.8 million in-migrants made it a close second. With 1.4 million in-migrants, Texas was the only other state to exceed 700,000. New York, Illinois, Virginia and Washington also experienced greater in-migration than Arizona.

Arizona encountered out-migration of 353,000 residents between 1975 and 1980. A number of states, primarily in the Northeast and near the Great Lakes, lost more people, including 1.7 million from New York and 1.1 million from Illinois. While nearly 1 million people moved out of Florida, net migration still exceeded 800,000. Likewise, despite nearly

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Quarterly Forecast Update

Economy To Continue on Roller Coaster

National economic growth remains erratic, as predicted in the last quarterly forecast of the Bureau of Business and Economic Research (April 1985 *Arizona Business*). The stronger expansion of the Gross National Product (GNP) during the fourth quarter, 1984, had led many analysts to be optimistic about economic performance during early 1985. Instead, GNP barely rose during the first quarter, throwing both the public and private sectors into confusion. A sharp drop in productivity, coupled with acceleration in the inflation rate,

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900,000 people leaving, Texas netted more than 500,000 new residents. In contrast, 1.8 million people left California, nearly as many as moved there.

Such aggregate figures mask a number of conflicting migration patterns, which this article will briefly examine.

IN-MIGRATION FROM THE EAST

Arizona's large net gain in population from migration was primarily due to heavy in-migration from the Northeast and Midwest, with little return flow from Arizona to those regions (see Figure I). More than one-half of Arizona's net migration came from just four states: Illinois, Michigan, Ohio and New York. Each contributed at least 25,000 people to the Arizona population between 1975 and 1980. Together with net inflows from six other states — Pennsylvania, New Jersey, Wisconsin, Minnesota, Indiana and Iowa — 80 percent of Arizona's net migration is explained.

Arizona's two metropolitan counties received 88 percent of the state's total net migration from other states during the 1975-80 period. The Phoenix metropolitan area, with net in-migration of 177,000 people, gained two new residents from out-of-state for every resident who left Arizona, a ratio greater than that of any Arizona county except Mohave. The Tucson metropolitan area received net in-migration of just 38,000, as two residents moved out-of-state for every three who moved into Pima County. Four counties — Apache, Graham, Greenlee and Santa Cruz — suffered net out-migration of residents to other states between 1975 and 1980 (see Table 1).

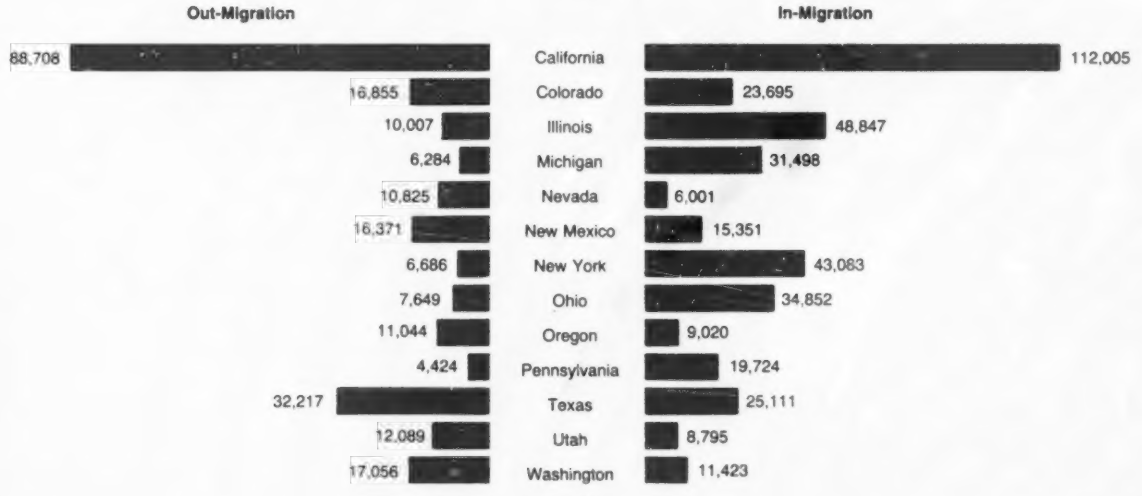
TABLE 1
ARIZONA NET MIGRATION
By County, 1975-80

County	Other States	Other Arizona Counties
Apache	−1,148	556
Cochise	4,874	−3,253
Coconino	1,818	2,669
Gila	96	− 406
Graham	− 649	1,073
Greenlee	− 563	− 628
Maricopa	176,731	−3,988
Mohave	14,048	− 341
Navajo	115	2,003
Pima	37,969	1,713
Pinal	3,069	− 737
Santa Cruz	− 446	− 790
Yavapai	6,944	3,809
Yuma	2,831	−1,880
TOTAL	245,688	0

Source: Calculations of the Bureau of Business and Economic Research in the College of Business, Arizona State University, from *Census of Population, 1980: County to County Migration Flows*, prepared by U.S. Bureau of the Census.

Net migration from within the United States was responsible for approximately 60 percent of Arizona's population gain between 1975 and 1980. In-migration from foreign countries and U.S. possessions numbered nearly 52,000, accounting for approximately 10 percent of the population growth, although the number of out-migrants from Arizona to other countries is unknown. The remainder

FIGURE I
ARIZONA MIGRATION TO AND FROM SELECTED STATES
1975-80



Source: U.S. Bureau of the Census and the Bureau of Business and Economic Research in the College of Business, Arizona State University.

TABLE 2
NET MIGRATION TO TWELVE WESTERN STATES

	Total, All 50 States	Excluding 12 Western States	12 Western States Only	10 Western States*	California Only
Texas	574,007	526,859	47,148	5,010	40,006
Washington	280,417	122,606	157,811	46,122	105,054
Arizona	245,688	239,359	6,329	– 23,808	23,297
Oregon	166,856	56,466	110,390	– 1,258	105,818
Colorado	128,685	125,832	– 24,147	– 37,662	13,515
Nevada	112,689	58,420	54,269	– 4,038	56,236
California	94,458	495,926	–401,468	–387,953	—
Utah	66,398	29,383	37,015	9,126	25,561
Wyoming	47,358	31,763	15,595	4,109	4,805
Idaho	44,378	20,772	23,606	– 5,830	27,373
New Mexico	30,080	33,414	– 3,334	– 9,870	4,760
Montana	1,518	14,818	– 13,300	– 19,563	4,957

*Excluding California and Colorado.

Source: Calculations of the Bureau of Business and Economic Research in the College of Business, Arizona State University, from *Census of Population, 1980: County to County Migration Flows,* prepared by U.S. Bureau of the Census.

of Arizona's population growth was due to a net natural increase from births minus deaths.

OUT-MIGRATION TO THE WEST

Large net in-migration hides the fact that Arizona suffered net out-migration of residents to most other western states. More people moved from Arizona to Washington, Oregon, Idaho, Wyoming, Utah, Nevada, New Mexico and Texas than moved from each of these states to Arizona.

The western states from which Arizona received net in-migration — California, Colorado and Montana — sustained net out-migration to each of the other western states as well (see Table 2). Arizona received net in-migration of 23,000 people from California, but every other western state also gained population from California. The number entering Arizona from California was dwarfed by the more than 100,000 California residents received by both Oregon and Washington. Even Utah and Idaho claimed more residents from California than did Arizona.

The divergent migration patterns among the western states are illustrated in Table 2. California is at one extreme, receiving huge net in-migration from eastern states but losing nearly as large numbers to other western states. Washington is at the other extreme, with relatively modest net in-migration from eastern states but the greatest number of residents from other western states. Arizona's situation is more similar to that of California — strong net in-migration from eastern states but net out-migration to other western states (excluding California).

TABLE 3
ARIZONA NET MIGRATION
By Age Group, 1975-80 (In thousands)

Age in 1980	All States	11 Western States*	9 Western States**
5-14	30.5	– 1.4	– 7.3
15-19	18.7	0.0	– 3.3
20-24	32.5	– 4.1	– 3.9
25-29	19.0	– 5.7	– 3.7
30-34	15.6	– 2.8	– 3.9
35-39	15.0	0.0	– 2.9
40-44	10.2	0.2	– 1.8
45-49	9.6	– 0.3	– 1.6
50-54	11.5	1.7	– 0.5
55-59	18.4	4.2	0.0
60-64	24.3	5.6	1.5
65-69	22.0	5.2	2.1
70-74	10.7	2.6	1.2
75 & older	7.5	1.0	0.2
TOTAL	245.7	6.3	–23.8

*The 11 western states are California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Utah, Washington and Wyoming.

**The nine western states exclude California and Colorado.

Source: Calculations of the Bureau of Business and Economic Research in the College of Business, Arizona State University, from *Census of Population, 1980: County to County Migration Flows,* prepared by U.S. Bureau of the Census.

The people leaving Arizona for other western states are predominantly in their 20s and early 30s (see Table 3). In contrast, Arizona is receiving net in-migration, even from the western states, of those at least 55 years old. Thus, Arizona is losing those residents who are in the prime consumption and child-bearing years.

Why people leave Arizona for other western states is unknown. Thus, only speculation is possible in attempting to project this pattern for the future. While the number of residents leaving Arizona for other western states was relatively small between 1975 and 1980, the mere presence of such out-migration is unusual. Should this out-migration increase in coming years, at a time when migration from eastern states is slowing,[1] Arizona's population

[1]People are most apt to move when young (18-34 years old) or when near retirement age (60-69 years old). Because the baby boom generation will age out of the 18-34-year-old group during the next 10 years, some slowing of in-migration is likely. Of course, if other migration patterns do not change, out-migration from Arizona should also slow.

gains could be substantially less than anticipated.

MIGRATION OF SENIOR CITIZENS

People between the ages of 55 and 69 years old constituted a major portion of the migration flow into Arizona during the 1975-80 period, as can be seen in Table 3. Isolating those of the traditional retirement age of 65 years and older, net migration to Arizona exceeded 40,100. With 61,400 in-migrants and just 21,300 out-migrants, the proportion of in-migrants to out-migrants is much higher among the elderly population than for the entire population (a ratio of 2.9, compared to 1.7). Net in-migration accounted for one-half of Arizona's total increase in senior citizens; the aging of residents constituted the other half.

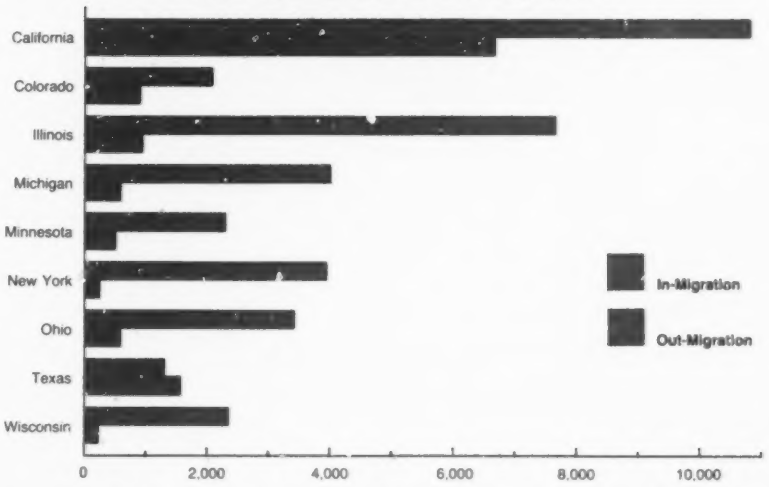
The migration patterns of senior citizens between 1975 and 1980 were somewhat different from those of the entire population. Arizona received net in-migration of senior citizens from nearly all of the western states, excluding California and Colorado, although it was isolated to people 60 years and older.

A sizable portion (40 percent) of the net inflow of senior citizens came from Illinois, New York, Michigan and Ohio, but this proportion was less than that for the entire population. Illinois alone provided net in-migration of more than 6,700 senior citizens, 17 percent of all elderly migrants (see Figure II). With the addition of Wisconsin, Minnesota, Iowa, Pennsylvania, Indiana and New Jersey, nearly two-thirds of all net in-migration of senior citizens to Arizona is accounted for. In contrast to the total population, Washington and Colorado were also strong contributors to the inflow of retirement-age people.

Elderly in-migrants to Maricopa County generally came from states far from Arizona, while a greater proportion of in-migrants from the western states chose Arizona's rural counties as their new home. More senior citizens left Coconino, Greenlee and Navajo Counties for other states than arrived from out-of-state, but the numbers involved were small.

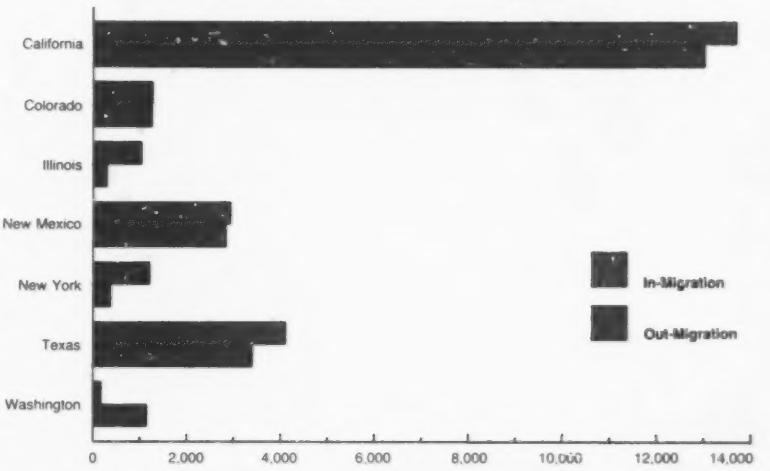
Arizona experienced net out-migration of senior citizens to only five states — Georgia, Louisiana, North Carolina, Hawaii and Texas — compared to net out-migration of the general population to 11 states. The number of elderly involved in this net out-migration was minimal, except to Texas.

FIGURE II
ARIZONA MIGRATION OF SENIOR CITIZENS TO AND FROM SELECTED STATES, 1975-80



Source: U.S. Bureau of the Census and the Bureau of Business and Economic Research in the College of Business, Arizona State University.

FIGURE III
ARIZONA MIGRATION OF HISPANICS TO AND FROM SELECTED STATES, 1975-80



Source: U.S. Bureau of the Census and the Bureau of Business and Economic Research in the College of Business, Arizona State University.

MIGRATION OF HISPANICS

Being a border state with a relatively large population of Hispanic origin, Arizona's net in-migration of Hispanics from other states was barely positive. One-half of all states received more Hispanics from Arizona than had Hispanic residents move to Arizona between 1975 and 1980. In particular, more Hispanics left Arizona for other western states than moved from those states to Arizona — a pattern similar to that of the entire population.

Arizona experienced the greatest net out-migration of Hispanics to the states of Washington, Nevada, Utah, Oregon and Hawaii. The greatest net inflows came from states outside the Southwest — Illinois and New York — states that contributed heavily to total net in-migration. California and